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Surgical intervention for the treatment of gastroesophageal reflux disease

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ABSTRACT

Gastroesophageal reflux disease (GERD) is for the most part a functional problem involving the esophageal lower sphincter resulting in reflux of gastric acid. Refluxed acid may subsequently cause classic symptoms such as heartburn, but additionally atypical symptoms of pneumonia and asthma. Several modalities can be used to characterize the disease, including esophagogastroduodenoscopy, pHmetry, and manometry. Specific indications for the surgical treatment of GERD have been recommended and surgery has been shown to reduce the need for postoperative medical treatment in most of the cases. An analysis of surgery vs medicine reveals a cost-equivalent point at roughly 10 years. Although fundoplication remains the goal standard for the surgical treatment of GERD, multiple variations exist, including Nissen, Toupet, and Dor, each incurring its own respective benefits and associated risks. Alternatives to fundoplication, such as the magnetic bead antireflux systems, have also been developed and are gaining favor throughout the world in large part owing to their ease of placement and favorable clinical results thus far. Nearly two-thirds of U.S. adults at some point in their lifetimes are affected by the common problem of GERD. The disease not only adversely affects an individual's well-being but also progression of GERD may eventually result in Barrett's esophagus and if left untreated, esophageal cancer. Modern antireflux surgeries offer a highly cost-effective solution to GERD with minimal morbidity when compared with lifelong antisecretory therapy.

1. Introduction

Gastroesophageal reflux disease (GERD), is caused by the reflux of gastric acid into the lower esophagus, which results in local irritation of tissue and symptoms. GERD was defined according to the Montreal consensus as “a condition that develops when the reflux of stomach contents causes troublesome symptoms and complications or both.” Symptoms were considered *troublesome* if they adversely affected an individual's well-being. The disease was then sub-classified either into esophageal or extraesophageal syndromes [1].

GERD is a functional problem resulting from the failure of the lower esophageal sphincter (LES), a component of the antireflux barrier. Consequently, an abnormal reflux of gastric contents into the esophagus occurs [2]. The mechanics by which GERD is believed to develop is via the breakdown of the antireflux barrier that consists of the LES, diaphragmatic crura, and phrenoesophageal ligament [3,4].

GERD is of epidemic proportions, affecting more than two-thirds of U.S. adults at some point in their lifetimes [5]. Known colloquially as heartburn, GERD will account for nearly 4-5 million physician office visits each year [6]. Physiologically, GERD has been linked to esophageal adenocarcinoma. However, the primary goal of surgical intervention in the treatment of GERD is to eradicate the unrelenting symptoms of disease.

2. Diagnosis of GERD

Before considering surgery, objective documentation of gastroesophageal reflux is mandatory. This can often be achieved by flexible esophagoscopy whereby an area of slough or erythema is demarcated from adjacent tissue, termed a “mucosal break” [7]. This can be considered as an objective proof of GERD in the appropriate clinical setting and is the minimum endoscopic finding to diagnose reflux esophagitis [8]. Alternatively, a peptic stricture is also acceptable endoscopic evidence of GERD in conjunction with clinical symptoms [9]. Finally, histological

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confirmation of Barrett's esophagus is considered as an objective proof of GERD, even though rare alternative causes do exist [10,11].

However, in the absence of endoscopic evidence of reflux, the gold-standard objective test for diagnosis of GERD is ambulatory esophageal pHmetry. Variables with the highest sensitivity and specificity obtained from this test include the following: total time with pH $<$ 4 as recorded by a probe above the LES and a composite score or DeMeester Score (Table 1).

An alternative diagnostic modality to the catheter-based pHmetry is the wireless esophageal pH-monitoring probe (Bravo, Medtronic; Shoreview, MN). The Bravo requires transoral placement via endoscopy. Manometry may be used for localization of placement or upper endoscopy may be used for direct visual placement. Although the probe is considered equivalent to the catheter-based system, no additional benefit has been actualized by prolonging the study period to 48 hours [13,14]. The Bravo pH probe is wireless, which the patients may find beneficial, whereas the ambulatory esophageal pHmetry is affixed trans-nasally, resulting in some discomfort and possible social anxiety.

Another alternative, PillCam ESO2 (Given Imaging; Yoqneam, Israel), was Food and Drug Administration (FDA) approved for esophageal imaging in 2007. The camera differs from the standard small bowel PillCam in that the 26 $\times$ 11 mm capsule features optical views on both sides, possesses the ability to take 9 FPS (vs the standard 2), and displays a wider angle of view [15]. Although the sensitivity and specificity values applied for the detection of GERD have varied through different studies, one multicenter trial revealed a sensitivity of 92% and a specificity of 95% in the detection of GERD when compared to standard endoscopy [16]. Despite this advantage, the capsule is able to detect only objective lesions, whereas the pHmetry and Bravo are designed to diagnose reflux based on acidity level.

3. Medical vs surgical treatment

Once the diagnosis of GERD has been established by one of the aforementioned methods, the decision to treat with either medical or surgical intervention must be made. In 2010, the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) published guidelines that reviewed this topic. It stated the following. “Surgical therapy for GERD is an equally effective alternative to medical therapy and should be offered to appropriately selected patients by appropriately skilled surgeons. Surgical therapy addresses the mechanical issues of GERD and results in long-term patient satisfaction. For surgery to compete with medical treatment, it has to be associated with minimal morbidity and cost.” This statement stemmed from the literature regarding topics such as quality of life, postoperative reduction of acid-reducing medications, and cost of surgery.

Multiple studies have examined whether medical or surgical treatment is more beneficial [17-23]. The bulk of this research asserts that surgery is an equally effective option when compared to medical treatment alone not only in patients who are partially symptomatic on proton pump inhibitors (PPIs) but also in patients on medical therapy with good symptom control [18-23]. The effectiveness of surgery was exemplified in numerous investigations that employed both pHmetry and manometric data. Postoperative findings demonstrated an increase in LES pressure which resulted in decreased esophageal exposure to refluxed acid [18,19,24-26]. This reduction in postoperative exposure to refluxed acid results in a surgical cure for GERD and subsequently reduces the necessity of acid-suppressing medication for many patients. Although a veterans affairs-conducted prospective randomized controlled trial suggested that 62% of postoperative patients still required the use of antireflux medication at some point, the research did not quantify or qualify this statistic [17]. In contrast, most of the literature cites a significantly lower rate of need for postoperative medication, more commonly ranging between 9% and 21% [20-28]. Furthermore, studies also determined that of those few postoperative patients who restarted acid-reducing medications, none had evidence of GERD on 24-hour pH measures [29-30]. Thus, it appears that surgical intervention has the advantage of decreased postoperative exposure to refluxed acid, resulting in an overall reduced need for acid-suppressing medications.

Quality of life has also been heavily investigated. Surgery results in an improved or at least equivalent quality of life when compared with medical intervention alone and is associated with higher patient satisfaction scores [18,19,21,22,25]. Regarding expense, one particular study compared the cost between medical and surgical interventions over a 5-year period and claimed that cost of medical treatment was significantly lower [31]. However, another study calculated the cost equivalency point at roughly 10 years [32]. At that juncture, among patients with life expectancy at or greater than 10 years, it appears that surgical intervention will result in reduced cost and an improved quality of life.

Table 1
Components of 24-hour Esophageal pH Monitoring [12]

Percent total time pH $<$ 4
Percent upright time pH $<$ 4
Percent supine time pH $<$ 4
Number of reflux episodes
Number of reflux episodes $\geq$ 5 min
Longest reflux episode (min)

4. Surgical intervention

4.1. Indications for surgical intervention of GERD

With the diagnosis of GERD confirmed and the known benefits of surgery over medical treatment understood, the indications for surgical intervention must be evaluated. Once GERD is objectively confirmed, surgical therapy should be considered in the following individuals who

(1) failed medical management either due to lack of symptom control or due to side effects secondary to the medical intervention;
(2) desire surgery despite successful medical management because of life quality considerations such as lifelong need for medication intake or the expense of long-term medical treatment;
(3) have a diagnosis of GERD [33,34]; and
(4) have extraesophageal manifestations, including asthma, hoarseness, cough, chest pain, or aspiration [35-38].

Regarding Barrett's esophagus, symptomatic disease is considered by many as a clear indication for antireflux surgery [39]. On the contrary, surgical intervention for asymptomatic Barrett's esophagus remains controversial.

4.2. Preoperative workup

A preoperative workup must be completed for those who are selected for surgical intervention. Currently, however, no consensus exists regarding the specifics of which studies are required in the preoperative workup and there is considerable vari-